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(54) LONG-LENGTH SUPERCONDUCTOR MANUFACTURING METHOD

(57) Abstract: The invention relates to the electrical engineering, in particular to methods for producing superconductors based on high-temperature superconducting oxide compounds. An object of the invention is an enhancement in technological capabilities of the method by increasing the homogeneity of a core structure. The method consists in that an oxide powder 8 exhibiting the superconducting properties at 100K and above is continuously supplied onto a surface of a longitudinally moving metallic band 3 made of an oxygen-pervious metal. The band having the powder applied thereon is wrapped to contact the edges, thereafter the edges are welded to form a blank and the blank is deformed to a desired size. 1 Figure.

The invention relates to the electrical engineering, in particular to methods for producing superconductors based on high-temperature superconducting oxide compounds.

An object of the invention is an enhancement in technological capabilities of the method by increasing the homogeneity of a core structure.

10 A schematic view of a device implementing the described method is shown in the drawing.

The method consists in that an oxide powder exhibiting the superconducting properties at 100K and above is continuously supplied onto a surface of a metallic band 3 longitudinally moving in one direction and made of an oxygen-pervious metal, the band having the powder applied thereon is wrapped 20 to contact the edges, thereafter the edges are welded to form a blank in the form of a tubular metallic envelope having a core arranged therein and made of the fine superconducting powder. The resulting blank 25 is deformed to a desired size. Powdery mixtures of oxides which are referred to also as high-temperature superconducting ceramic materials, when being used correctly and being appropriately heat-treated, exhibit the 30 superconductivity at 100K and above. Such high critical temperatures allow the use of liquid nitrogen as a cooling medium and substantially increase the economical efficiency as compared to the helium cooling 35 used up to now. Enclosure of a mixture of oxides into the metallic envelope according to the present method facilitates the manufacture of superconductors of almost unlimited length. The envelope itself serves as a mechanical 40 support, especially at locations of joints and seams, and also as a normal stabilizing electrical conductor.

The mixture of oxides, i.e. the so-called ceramic material, comprises copper, lead, or 45 bismuth. The presence of at least one of the group II and III elements of the Periodic table is essential for the superconductor composition. From the group II, these are mainly strontium and barium which, in 50 combination with the group III elements, e.g. yttrium and lanthanum, provide for the achievement of a high critical temperature. The powdery mixture of oxides can be

subjected to a heat-treatment before, during or 55 after it is enclosed into the blank. The heat-treatment is advantageously performed at temperatures of from 850 to 1650°C, preferably at 100-1500°C. If the heat-treatment is performed during or after the 60 blank is obtained, then metals having an appropriately high melting point should be used as a material of the envelope. It is advantageous to make the envelope of an oxygen-pervious metal or alloy. For example, 65 silver or a silver alloy is suitable.

A reduction in cross-sectional area of the blank obtained is advantageously performed at such an extent that a mechanical compaction of the powdery mixture of oxides is achieved 70 thereby.

EXAMPLE. From a drum 2 mounted on a base box 1, a metallic band 3 made, e.g., of silver is brought, via a deflecting device 4 serving if necessary also to clean the band, to 75 a machine installation 5. The metallic band 3 is shaped in the form of a tube 6 within this installation by shaping tools, for example by rollers or rolls installed offset. A powdery oxide mixture 8, e.g. La-Sr-Cu-O; Ba-Pb-Bi-O; Ba-La-Cu-O; Y-Ba-Cu-O, is introduced 80 into the tube 6 still open from above by means of a supply device 7. When passing the band further through the installation 5, band edges are welded by a welding apparatus 9 to form a 85 blank which is reduced in its cross-section area when passing through a sizing tool 10. The cross-section is reduced by subsequent sizing devices 11 until a sufficient compaction of particles of the powder 8 is achieved. If 90 necessary, a heat-treatment may be then performed.

The present method enables to produce almost unlimited lengths of superconductors based on high-temperature superconducting 95 compounds with a high homogeneity of the composition throughout the conductor length.

CLAIM

A method for manufacturing a long-length superconductor, in which a blank in the form of a tubular metallic envelope having a core
5 arranged therein and made of a fine superconducting powder is shaped and then is deformed to a desired size, characterized in that, in order to enhance technological capabilities by increasing the homogeneity of
10 the core structure, an oxide powder exhibiting the superconducting properties at 100K and above is used as said powder, is continuously supplied onto a surface of a metallic band longitudinally moving in one direction and
15 made of an oxygen-pervious metal, the band having the powder applied thereon is wrapped to contact its edges, and thereafter the edges are welded to form said blank.